

ENDANGERED *Species* BULLETIN

September/October 2000

Vol. XXV No. 5



*H*abitat loss is recognized as the greatest threat to most plants and animals on the list of threatened and endangered species. Many people are also aware of other activities that directly harm listed species, such as killing and over-exploitation for trade purposes. Unfortunately, these are not the only dangers. With human assistance, species from one part of the world are invading other regions that have no defense against them. These invaders can be as large as a snake, as small as a bacterium, or as seemingly harmless as a wildflower. Other threats, such as contaminants from industrial and agricultural sources, are often unseen until they cause fish die-offs, malformed frogs, or thin-shelled eggs (left). This edition of the Bulletin takes a look at these lesser-known threats.



U.S. Fish & Wildlife Service

Photo by Susan M. Lawrence

WASHINGTON D.C. OFFICE *Washington, D.C. 20240*

Jamie Rappaport Clark, *Director*
Gary Frazer, *Assistant Director for Endangered Species*

Nancy Gloman, *Chief, Office of Conservation & Classification* (703)358-2171
Martin Miller, *Acting Chief, Office of Consultation, HCPs, and Recovery* (703)358-2171
Kathi Bangert, *Chief, Office of Information Management* (703)358-2390
Kathy Walker, *Chief, Office of Program Support* (703)358-2079

REGION ONE *Eastside Federal Complex, 911 N.E. 11th Ave, Portland OR 97232*

*California, Hawaii, Idaho, Nevada, Oregon,
Washington, American Samoa, Commonwealth
of the Northern Mariana Islands,
Guam and the Pacific Trust Territories*

Anne Badgley, *Regional Director* (503)231-6118
<http://pacific.fws.gov/>

REGION TWO *P.O. Box 1306, Albuquerque, NM 87103*

Arizona, New Mexico, Oklahoma, and Texas

Nancy Kaufman, *Regional Director* (505)248-6282
<http://southwest.fws.gov/>

REGION THREE *Federal Bldg., Ft. Snelling, Twin Cities MN 55111*

*Illinois, Indiana, Iowa, Michigan,
Minnesota, Missouri, Ohio, and Wisconsin*

William Hartwig, *Regional Director* (612)715-5301
<http://midwest.fws.gov/>

REGION FOUR *1875 Century Blvd., Suite 200, Atlanta, GA 30345*

*Alabama, Arkansas, Louisiana, Georgia, Kentucky,
Mississippi, North Carolina, South Carolina, Florida,
Tennessee, Puerto Rico, and the U.S. Virgin Islands*

Sam Hamilton, *Regional Director* (404)679-7086
<http://southeast.fws.gov/>

REGION FIVE *300 Westgate Center Drive, Hadley, MA 01035*

*Connecticut, Delaware, Maine, Maryland,
Massachusetts, New Hampshire,
New Jersey, New York, Pennsylvania, Rhode Island,
Vermont, Virginia, and West Virginia*

Mamie Parker, *Acting Regional Director* (413)253-8300
<http://northeast.fws.gov/>

REGION SIX *P.O. Box 25486, Denver Federal Center, Denver CO 80225*

*Colorado, Kansas, Montana, Nebraska, North
Dakota, South Dakota, Utah, and Wyoming*

Ralph O. Morgenweck, *Regional Director* (303)236-7920
<http://www.r6.fws.gov/>

REGION SEVEN *1011 E. Tudor Rd., Anchorage, AK 99503*

Alaska

Dave Allen, *Regional Director* (907)786-3542
<http://alaska.fws.gov/>

ENDANGERED *Species* BULLETIN

Telephone: (703)358-2390

Fax: (703)358-1735

Internet:

<http://endangered.fws.gov>

Editor

Michael Bender

Associate Editor

Martha Balis-Larsen

Editorial assistance provided by

Susan D. Jewell

Layout by

Dennis & Sackett Design, Inc.

Contributors

Russell D. Jeffers

Steve Johnson

Susan Jewell

Ken Burton

Kelly Geer

Sherry Krest

Raye Nilius

Geo Graening

Craig Springer

Barbara Maxfield

Michael F. Delany

On the Cover

The high numbers of malformed frogs and other amphibians being found at various locations may indicate potentially serious environmental threats.



The Endangered Species Bulletin welcomes manuscripts on a wide range of topics related to endangered species. We are particularly interested in news about recovery, habitat conservation plans, and cooperative ventures. Please contact the Editor before preparing a manuscript. We cannot guarantee publication.

The Fish and Wildlife Service distributes the Bulletin primarily to Federal and State agencies, and official contacts of the Endangered Species Program. It also is reprinted by the University of Michigan as part of its own publication, the Endangered Species UPDATE. To subscribe, write the Endangered Species UPDATE, School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI 48109-1115; or call (734) 763-3243.



Printed with vegetable-based ink on recycled and recyclable paper. If you do not keep back issues, please recycle the paper, pass them along to an interested person, or donate them to a local school or library.

IN THIS ISSUE

- 4 **The Mystery of the Dying Eagles**
- 6 **Disease Strikes Again at Salton Sea**
- 8 **A Unified Defense Against Invasive Species**
- 11 **An Invader Worse Than a "B" Movie**
- 12 **A New Threat to Frogs**
- 14 **Ozark Underworld**
- 18 **Rounding up Razorbacks**
- 20 **The Low-down on Grasshopper Sparrow Nests**
- 22 **Hawaiian Bird Chick is a First**

Departments

- 23 **Listing Actions**
- 26 **Regional News and Recovery Updates**
- 27 **On the Web**
- 28 **Box Score**

by Russell D. Jeffers

The Mystery of the Dying Eagles



American coots (above) and bald eagles (opposite page) were the first species of birds observed to suffer from the disease now known as Avian Vacuolar Myelinopathy.

Photos by Tom Augspurger

During the winter of 1994-1995, DeGray Lake, Arkansas, was the scene of a grave situation; 29 bald eagles (*Haliaeetus leucocephalus*) were found dead. Wildlife officials desperately tried to determine the cause. The die-off did not repeat the following winter (1995-1996), but it did occur again in the winter of 1996-1997 when an additional 26 eagles died. Officials also observed aberrant neurologic signs in the wintering population of American coots (*Fulica americana*) at the lake. Eagles and coots were collected and sent to the U.S. Geological Survey's National Wildlife Health Center (NWHC) in Wisconsin for examination. Pathologists determined that all of the eagles and some of the coots had strange lesions, or vacuoles, in the white matter of their central nervous system. These vacuoles have now been confirmed in five different southern states in both coots and eagles as well as three species of migratory waterfowl.

Because the disease was discovered in bald eagles and coots, it was first referred to as Coot and Eagle Brain Lesion Syndrome (CEBLS). However, the discovery of the disease in other waterfowl species in 1999 prompted a change; the disease is now called Avian Vacuolar Myelinopathy, or AVM. Scientists of the University of Georgia's Southeastern Cooperative Wildlife Disease Study (SCWDS), along with numerous other officials, have sampled for diseased birds at 36 sites in 15 different states. As a result, AVM has been confirmed in birds from nine different southern reservoirs, including three in Arkansas, one in Texas, one in Georgia, one in North Carolina, and three in South Carolina. The disease has

caused the deaths of at least 69 bald eagles, hundreds of coots, and a small number of other waterfowl since 1994. In addition, records from North Carolina suggest that AVM could have occurred in that state as early as 1990. Currently, more AVM die-offs are being reported this season.

The information gathered so far suggests that a synthetic or naturally occurring toxicant is the most probable cause of the disease. The toxicant specifically targets the central nervous system, creating vacuoles that are apparent only through microscopic examination of very fresh brain tissue. Several compounds are known to cause similar lesions, but none have been detected in the affected birds. Pathologists have found that the condition occurs due to separation of myelin, a fat-rich nerve coating that surrounds and protects the nerves of the central nervous system, causing spaces in what should be a tightly compacted layer of cells. As the myelin layers separate, nerves lose their normal capacity to transmit and receive electrical impulses. This evidence is consistent with observations of affected birds in the field.

Eagles suffering from AVM have been seen overflying stoops and flying into trees and rock ledges. Affected waterfowl show reluctance to fly, erratic flight, or even an inability to fly. While swimming, birds may often show signs of partial paralysis on one side. This may result in the bird swimming with one leg extended behind the body, swimming in circles, or swimming upside down. On the ground, waterfowl and eagles may seem disoriented or lethargic, and may stumble and wobble as they move. These clinical signs,

however, may not always be apparent. Epidemiological studies have confirmed AVM lesions in coots exhibiting no apparent signs of abnormality. Impaired and dead AVM-positive birds have generally been observed between October and March, with a peak from mid-November through early December.

Federal and state agencies, as well as numerous academic institutions, have joined to find the cause of AVM and its route of exposure. Inventories of plant and animal food items are being compiled to determine if a naturally occurring plant toxin or contaminated food/water is the source of the disease. In addition, food items from AVM sites are being fed to surrogate bird species in an attempt to isolate a source.

Scientists are analyzing water and sediments as well. The Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, Ross Foundation, Henderson State University, the University of Georgia and others are involved in these studies.

Because the behavior and habits of a bird influence where, when, and how it will forage, natural history studies provide valuable information on potential routes of exposure. Arkansas State University has used radio-telemetry to monitor bald eagle movements and feeding behavior on AVM reservoirs. The feeding ecology of American coots has also been studied by Texas A&M University and the Savannah River Ecology Laboratory (SREL). The SREL, Corps of Engineers, Arkansas Game & Fish Commission, and Ouachita Baptist University have tagged and released hundreds of coots to monitor their movement patterns at AVM sites. A Geographical Information System database is also being compiled. Additionally, sentinel birds have been released by the NWHC and the Fish and Wildlife Service on AVM sites to gain a more controlled approach at studying the disease.

Although a specific cause of AVM has not yet been isolated, many of the gaps are beginning to fill. Since the initial description of the disease in 1994,



Dr. Nancy J. Thomas of the USGS National Wildlife Health Center in Madison, Wisconsin, examines a dead bald eagle.

a great deal of information has been uncovered. We now know that the situation in Arkansas was not an isolated incident and that AVM has a wide distribution in the southern U.S. We also now believe that AVM existed prior to the 1994 Arkansas incident. It has been determined that AVM is not a prion-related disease, like “mad-cow disease,” but is more likely the result of exposure to a synthetic or naturally occurring toxicant. We suspect that AVM is acquired at specific sites and that the onset of the disease can be fairly rapid. Therefore, birds that move into an AVM site may relatively quickly be affected by the disease.

If anyone has additional information or suspects that AVM may have struck again, please contact the National Wildlife Health Center at 608-270-2448.

Russell D. Jeffers is a Toxicologist in the Service's Charleston, South Carolina, Field Office.

by Steve Johnson

Disease Strikes Again at Salton Sea



This juvenile brown pelican died before it could be rescued.

Photos by Steve Johnson

Once again, an avian botulism outbreak struck the Sonny Bono Salton Sea National Wildlife Refuge, an important Pacific flyway stopover for migratory birds in southern California, last summer. Since 1996, pelicans and other piscivorous (fish-eating) birds at the Salton Sea have been struck with “type C” botulism. Because of their feeding habitats, pelicans and other piscivorous birds usually don’t contract avian botulism. However, this type doesn’t follow the typical avian botulism cycle.

The U.S. Geological Survey’s National Wildlife Health Center in Madison, Wisconsin, is working to determine exactly how the birds contracted the botulism. Since June 26, 2000, the toxin has killed 717 endangered brown pelicans (*Pelecanus occidentalis*). Of the 1,300 brown pelicans sickened by botulism this year, almost 600 have been successfully rehabilitated and released. The total number of brown pelicans affected this year was close to the total from the worst year, 1996, when 1,429 sickened or dead brown pelicans were retrieved. The last rehabilitated brown pelicans, 15 in all, were released on December 11, 2000.

The outbreak also sickened and killed birds from another 35 species, including American white pelicans (*Pelecanus erythrorhynchos*). Only birds that consume tilapia (*Oreochromis mossambicus*), a saltwater sport fish introduced from Africa, were directly affected by the disease. Scientists from the National Wildlife Health Center traveled to the refuge to take samples of the tilapia for analysis.

Botulism outbreaks have involved pelicans every year at the Salton Sea since 1996, but last summer’s outbreak

started earlier than usual because of warmer June temperatures. While past outbreaks generally have killed more white pelicans, last year’s epidemic killed mostly brown pelicans that are less than one year old. The outbreak officially began June 26, and ended November 22, 2000.

Fifteen Service employees at the refuge worked in shifts 18 hours a day to care for the sick birds. Two Service airboats patrolled the sea all day, every day, to round up sick birds and ferry them back to the on-site pelican rehabilitation hospital. The California Department of Fish and Game (CDFG) provided the refuge with an airboat and crew to assist with disease response efforts. Workers from the CDFG, Salton Sea Authority, and Bureau of Reclamation aided refuge staff during this crisis.

The open-air bird hospital, built in 1997 with money raised by volunteers, can accommodate up to 100 sick birds at a time. Pelicans spend up to 24 hours at the hospital before being sent to one of four off-site, licensed rehabilitation centers, most of which are run by volunteers. Release sites for fully recovered pelicans are located on the coast near the Tijuana Slough and Seal Beach national wildlife refuges in southern California.

Birds that contract avian botulism lose involuntary muscle control, including eyelid function, have clenched feet, and can’t hold up their heads. The disease is not fatal if treated in its early stages. The pelicans, however, are not easily captured until they start showing these symptoms and are seriously ill. Once captured, the pelicans are taken immediately to the refuge’s avian hospital for emergency treatment. This

includes flushing their systems with fresh water and administering antibiotics to their eyes, which become dry and infected when the eyelid muscles are paralyzed. Dead and dying birds must be retrieved quickly from the sea before gulls and shorebirds begin feeding on the fly larvae hatching in the bodies, which can spread the disease. Dead birds are incinerated at the refuge to avoid further spread of botulism. Humans are not generally at risk of contracting avian botulism, but staffers working with sick birds take precautions against botulism and other diseases by wearing rubber boots and gloves, and by cleaning all surfaces and equipment with a bleach solution.

Avian botulism breaks out at the Salton Sea when bacteria and a variety of environmental conditions, including heat, come together to cause a massive growth of algae—an algal “bloom”—which robs fish of oxygen. Researchers at the National Wildlife Health Center believe tilapia concentrate toxins from the Salton Sea in their stomachs. When pelicans ingest tilapia that have been oxygen-deprived, the birds are poisoned. Scientists believe tilapia are easy targets for juvenile pelicans because the fish become sluggish when they are deprived of oxygen.

Disease outbreaks are a chronic problem for the Salton Sea. As a closed body of water fed by the Colorado River and surrounding agricultural lands of Imperial County, it has no way to rid itself of excess salt and nutrient build-up. It is 25 percent saltier than the Pacific Ocean due to the tremendous evaporation that takes place during the hot summer months. As the weather heats up, water evaporates, increasing salinity and creating ideal conditions for botulism. Salinity levels at the sea have been increasing yearly.

At 227 feet (70 meters) below sea level, the Salton Sea is one of the lowest spots in the United States. It also is one of the hottest—summer temperatures top 115 degrees F (47 degrees C) and the daily highs stay above 100 degrees

F (38 degrees C) for 4 months running—and driest, with fewer than 3 inches (7.5 centimeters) of rainfall each year. The Salton Sea is the largest inland body of water west of the Rockies, 35 miles (56 kilometers) long and 9 to 15 miles (14 to 24 km) wide, with an average depth of about 40 feet (12 m). It was created in 1904, when a dike broke and allowed Colorado River water to flow into a natural basin. Since that time, 95 percent of other wetlands in California have been lost to development, making the Salton Sea a critical stopover for migratory birds and habitat for nearly 400 species.

Steve Johnson is a Wildlife Biologist at the Sonny Bono Salton Sea National Wildlife Refuge.



A juvenile brown pelican at the field hospital. This bird is in relatively good condition and has a good chance for survival. Note the sicker birds lying down in the background.



A Temporary Biological Technician places a sick brown pelican in a pillowcase (or “pellycase”) to prevent the bird’s injury or escape while en route to the field hospital.

A Unified Defense Against Invasive Species



Dandelions
Corel Corp. photo

Long ago, the word “weed” crept into our vocabulary. It identified plants that grew where we didn’t want them. Little did we realize, when we were young, that everything we learned was a weed was most likely an alien plant. These included the dandelion (*Taraxicum officinale*), ox-eye daisy (*Chrysanthemum leucanthemum*), white clover (*Trifolium repens*), and sweet honeysuckle (*Lonicera japonicum*) of the typical American suburban yard, brought from another continent intentionally or by accident. Homesick colonists brought their favorite flowers, medicinals, and edibles from the Old World. Lodged in the hooves of livestock were seeds from European pastures. By the time we recognized these plants as a problem, most Americans assumed they had always been here.

Now we recognize that invasives (alien species whose introduction causes or is likely to cause harm to the economy, environment, or human health) are not just an inconvenient affront to our landscaping efforts. Federal agencies spent \$631.5 million on invasive species issues in FY 2000, with about \$31 million coming from the Department of the Interior. The spread of invasives is estimated to cost Americans as much as \$138 billion annually in crop, timber, and commercial fishing losses; human health problems; navigational (e.g., boating) interference; and damage to structures. Add to that the immeasurable damage caused by introduced organisms that injure or kill people or cause native species to go extinct, such as West Nile virus, smallpox, Africanized bees (*Apis mellifera scutellata*), and brown tree snakes

(*Boiga irregularis*), and you get a problem of incalculable dimensions across North America.

In 1904, a fungus (*Cryphonectria parasitica*) from Asia that was first discovered in New York City cost us our precious American chestnut trees (*Castanea dentata*). These trees, giants among the eastern deciduous forests from Maine to Georgia and west to the Ohio River Valley, were a staple of the Appalachian settlers. Their straight trunks, sometimes branchless for 50 feet (15 meters), could grow to ten feet (3 m) in diameter and provided ample rot-resistant lumber. The chestnuts nourished the locals and their livestock, provided cash from their sale to big cities by the box car, and fed such game species as bears, deer, squirrels, and turkeys. The blight swept through nine million acres (3.6 million hectares)

of eastern woodlands, killing all adult chestnut trees in the United States. Now, only an occasional sprout appears from a stump, only to die when its bark is old enough to fissure. A few large healthy trees remain in Canada. The economic hardship to homesteaders can't be estimated, nor can the loss of the mast crop to wildlife.

Since the early Spanish explorers released pigs into Florida in the 1500s, alien species have been arriving on our shores virtually nonstop. An estimated 50,000 species of plants and animals have been introduced into the United States. More than 200 species, such as hydrilla (*Hydrilla verticillata*), were from the aquarium industry alone.

Approximately 35-46 percent of the species on the endangered species list are there partly or entirely because of the effects of invasive species (Wilcove et al. 1998). This doesn't even count species like the American chestnut, which functionally died out before the Endangered Species Act was passed and therefore is not listed. The threats posed by some species are obvious; for example, Norway rats (*Rattus norvegicus*) are decimating seabird colonies on islands in Alaska where mammalian predators were naturally absent. Zebra mussels (*Dreissena polymorpha*) are clogging intake pipes, encrusting ship hulls and propellers, and smothering native mussels. Other examples are subtle; endangered southwestern willow flycatchers (*Empidonax traillii eximius*) are heavily dependent on willows, which are being displaced by non-native saltcedars (*Tamarix* spp.) in the Southwest.

What is the Federal government doing to stop this flood of new introduced species and control the spread of existing ones? Many applicable laws, such as the Plant Quarantine Act, the Animal Damage Control Act, the Federal Plant Pest Act, National Environmental Policy Act, the Endangered Species Act, and the Federal Noxious Weed Act, have been in effect for decades. Since 1990, the Service and National Marine



Fisheries Service have co-chaired the Aquatic Nuisance Species Task Force, established by the Non-Indigenous Aquatic Nuisance Prevention and Control Act. This Act was designed to prevent the introduction of and to control the spread of aquatic species and the brown tree snake. Furthermore, the Federal Interagency Committee for Management of Noxious and Exotic Weeds, focuses on integrated ecological approaches on Federal lands.

More recently (on February 3, 1999), President Clinton signed Executive Order 13112 on Invasive Species, which requires all Federal agencies whose actions may involve invasive species to join in the war to control their spread. The order created an Invasive Species Council that is chaired by the Secretaries of Interior, Agriculture, and Commerce,

Old World climbing fern (*Lygodium microphyllum*), a true fern which probably entered south Florida through a plant nursery, is native to Southeast Asia. It can grow in wet or dry habitats and can climb 30 feet (9m) up a tree and shade it to death. In the Everglades, it blankets entire tree islands.

Photo by Susan Jewell



Like the zebra mussel, the round goby, an invasive fish species from Eurasia, probably entered North America in the discharged ballast water of visiting ships. It competes with, and preys upon, native fishes.

Photo by David Jude

and includes the Departments of State, Treasury, Defense, and Transportation and the Environmental Protection Agency. On October 2, 2000, the Council released a draft National Invasive Species Management Plan outlining a coordinated strategy by the Federal agencies. This working document will be updated every two years.

The plan calls for some steps to be taken individually by Federal agencies and some jointly. Examples of action items include:

- **coordination and leadership**—establishing an oversight mechanism to comply with the executive order; setting up dispute resolution mechanisms; and analyzing legal and policy barriers;
- **prevention**—developing a screening system for evaluating intentionally introduced species;
- **early detection**—using the expertise of taxonomic experts; researching new methods of detection; providing an efficient means to notify Federal, State, tribal, and local agencies; and periodic species surveys in “hot spots” (such as near ports of entry);
- **rapid response**—establishing teams that can react quickly to control an

introduction of invasive species; determining which responses are most appropriate; and preparing a guide to assist the teams;

- **control and management**—providing more funding to Federal agencies; issuing instructions to Federal agencies to incorporate invasive species control in management plans; identifying exclusion methods for preventing the unwanted spread of species; accelerating the biological control program; and identifying interconnecting waterways and ways to block the spread of unwanted species;
- **international cooperation**—increasing global awareness of invasive species problems; and providing assistance to collect information on species in other countries;
- **research**—studying how invasive species can alter water chemistry, nutrient cycling, and otherwise alter natural habitats;
- **information management**—maintaining and enhancing the website (see below); linking the Council to all major databases; and
- **education and public awareness**—assessing the current invasive species communications, education, and outreach programs.

Mike Ielmini, the Invasive Species Coordinator for the Service’s National Wildlife Refuge System, believes, “There isn’t a branch of the Service that isn’t affected by invasives. We need to put an invasive species component in every management plan we do and always be thinking of ways to solve the problem.”

Susan Jewell is a biologist with the Division of Endangered Species in the Service’s Arlington, Virginia, headquarters office.

References

- Wilcove, D.S., Rothstein, J. Dubrow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *BioScience* 48:607-615.

by Ken Burton

An Invader Worse Than a “B” Movie

As fiction, the story might be rejected even by the low-budget kings of the worst that Hollywood has to offer: an alien snake makes its way to a South Pacific island as a silent stowaway. Within 10 years, it is firmly entrenched and manages to eliminate a handful of native birds while posing a threat to infant humans and other small mammals, short-circuiting high-voltage power lines, and inflicting serious economic damage.

The story, unfortunately, isn't B-grade fiction; the very real brown tree snake (*Boiga irregularis*) made its way from New Guinea to Guam, probably aboard a freighter, in the mid-1950s. By the late 1960s, the snake had dispersed across the island, leaving a monumental example of the kind of environmental havoc that can be wrought by a single invasive species.

Brown tree snakes are mildly venomous and nocturnal. Lacking natural predators, and with a rapid reproduction cycle that produces a dozen eggs twice a year, up to 13,000 snakes per square mile (5,020 per square kilometer) can be found in some forested areas of Guam. They consume lizards, small mammals, and birds (including their eggs), all at a voracious rate. At least 12 species of birds have disappeared from Guam and three other species, the Guam rail (*Gallirallus owstoni*), Mariana crow (*Corvus kubaryi*), and Guam Micronesian kingfisher (*Halcyon cinnamomina cinnamomina*), are precariously close to the same fate.

Brown tree snakes have not stopped with wreaking terror on the Guam ecosystem. Although they are not known to be fatal to adult humans, they have been known to enter houses and to bite infants in their bed. Brown tree snakes crawling on electrical power lines cause

short circuits and are responsible for frequent power outages on Guam. Since 1978, the snakes have caused more than 1,200 power failures, leading to food spoilage and computer failures as well as considerable economic burdens to the island's civilian government and military installations.

“The brown tree snake in Guam is a classic horror story. It is also a demonstration of what human carelessness can do to a closed ecosystem and how formidable and frustrating the problem can become — not to mention how difficult it can be to eradicate this kind of problem once it is out of the bottle,” said Cathleen Short, the Service's Assistant Director for Fisheries and co-chair of the interagency Aquatic Nuisance Task Force.

The battle against the brown tree snake was elevated when Congress named it specifically in the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, which established the task force. By serving as its co-chair and as chair of the Brown Tree Snake Control Committee, the Fish and Wildlife Service has provided leadership in the development of a cooperative Brown Tree Snake Control Plan. Within the Department of the Interior, the Office of Insular Affairs and the U.S. Geological Survey/Biological Resource Division also play key roles in coordinating activities among insular governments to help keep the snake from spreading to other islands, and in conducting critical research activities.

The U.S. Air Force and U.S. Navy have joined the fight against the snake and have focused on airports and aircraft inspections in an effort to keep the snake from spreading by air, while the government of Guam gives special attention to the island's civilian international airport.



Photo by Thomas Fritts/USGS

There is some excitement about a Department of Agriculture finding that acetaminophen, the active ingredient in some over-the-counter painkillers, is proving to be a lethal weapon in the battle against the brown tree snake. “Two 300-milligram tablets in a dead mouse, ingested by a brown tree snake, kills a snake within 3 hours,” said Mike Pitzler, a scientist with the U.S. Department of Agriculture who is based in Hawaii.

As promising as this approach may be, further research is needed before the household pain killer can be used indiscriminately across Guam. The acetaminophen apparently kills the snake by causing massive internal bleeding, and now researchers must determine if other species, such as carrion-eating wildlife, would be similarly affected.

Pitzler said 2 to 5 years of research trials still lie ahead before, and if, acetaminophen can be declared safe for the rest of the environment before being widely used to eradicate Guam's pre-eminent wildlife headache.

Ken Burton is a Public Affairs Specialist in the Service's Washington, D.C., Office.

A New Threat to Frogs

by Kelly Geer and
Sherry Krest



Photo above and opposite page by
Laura Eaton-Poole/USFWS

*I*n 1995, some middle school students from Minnesota were exploring a local wetland when they discovered something strange and more than a little disturbing: numerous frogs with misshapen, extra, or missing limbs. Suddenly, national attention focused on the issue of amphibian malformations. During the past 3 years, scientists and lay people have observed an increasing number of frogs and toads with severe malformations throughout the United States and in other parts of the world.

Malformations have now been documented in 38 species of frogs and 19 species of toads from 44 states, with occurrences as high as 60 percent in some local populations. Many scientists now agree that current numbers of reported malformations exceed any normal rate and that the situation warrants urgent attention. These malformations, along with the apparent decline of many amphibian species around the globe, are raising concerns about the world's ecological health. Scientists are studying a variety of possible causes for the malformations, including climate change, disease and fungal infections, parasites, water pollution, and even the thinning ozone layer and increased ultraviolet radiation.

Because of their porous skin, amphibians may be particularly susceptible to chemical contamination, making them early indicators of environmental changes that may initially go undetected by humans. The Fish and Wildlife Service has a keen interest in determining the cause of the frog malformation epidemic and in finding out if it is occurring on national wildlife refuges. Several federal agencies and researchers are involved in the amphibian decline and malformation issue. The Service,

with the expertise of its Division of Environmental Quality, is poised to assess the role that contaminants, including pesticides and pollutants, may play in amphibian malformations.

In 1997, the Service began conducting surveys on 55 national wildlife refuges and 1 national park in the northeast and midwest. Scientists found high rates of abnormal frogs on 13 refuges, 4 in the midwest and 9 in the northeast. Malformation rates were as high as 18 percent (anything above 3 percent is considered unusual). Alarm over the results of these initial surveys and interest in determining if the amphibian malformation phenomenon is occurring widely led the Service to launch a nationwide survey of its refuges in July 2000. During the summer, biologists and volunteers surveyed 43 refuges in 31 states from Alaska to Hawaii and Maryland to California. We are trying to determine if there is a relationship between contaminants and incidences of malformed frogs.

If pesticides or other chemicals used on refuges for farming or habitat management are linked to amphibian declines or malformations, we will seek alternative actions and practices.

What is the difference between a malformation and a deformity?

A deformity occurs when a part of the body that already exists becomes disfigured. For example, a frog may lose a foot when it is attacked by a predator. A malformation occurs when something goes wrong during the developmental stages, causing an organ or body part to form improperly. The abnormalities the Service and other researchers are addressing are actually malformations, even though many people refer to them as deformities.

Integrated Pest Management (IPM) techniques can minimize or even eliminate the need for potentially harmful pesticides used to control invasive weeds, mosquito that are disease vectors, and pests of agricultural crops. The IPM approach emphasizes cultural, biological, and physical pest management methods. When the Service finds that pesticide use is necessary, we first consider products that are the least toxic to amphibians and other non-target organisms. If the Service determines that pesticides used on lands adjacent to refuges are the likely cause of amphibian malformations, we will work closely with the landowners to help determine if there are other cost-effective and efficient pest control methods available. One way that we can assist these landowners is by collaborating in demonstration projects on Service lands to determine the best management practices.

The Service hopes that cooperative research efforts such as those being undertaken by our divisions of Environmental Quality and National Wildlife Refuges will help to reduce the threats



to our nation's amphibians and maintain the health of the refuge system and surrounding lands and waters.

Kelly Geer, is an Outreach Specialist with the Division of Environmental Quality in Arlington, Virginia. Sherry Krest is a Wildlife Biologist with the Chesapeake Bay Field Office.

Service Director, Jamie Rappaport Clark, is joined by Washington, D.C., area Girl Scouts to kick off the nationwide frog malformation surveys on national wildlife refuges.

USFWS photo



What types of malformations are occurring?

The most common malformations are partial hind limbs, missing hind limbs, and missing toes. Other malformations include missing feet, misshapen or underdeveloped feet and legs, missing eyes, webbing between the ankle and thigh of the hind leg, malformed front legs, clubbed feet, and extra hind or front legs. Internal abnormalities have also been found.

by Raye Nilius and
Geo Graening



Cave crayfish
USFWS photo

Ozark Underworld

The Ozarks region of northern Arkansas, northeastern Oklahoma, and southern Missouri is known for its brilliant autumn foliage, forested slopes, whitewater streams, icy cold springs, and caves. Springs, sinkholes, and caves are just a few examples of the types of karst features commonly found in the limestone and dolomite geology of this region. The term karst is derived from Krs, a place in Slovenia known for limestone geology (Elliott 2000). In the 17th century, eyeless white salamanders occasionally washed up out of caves in that region, and inhabitants believed they were the young of dragons that lived in the earth (Culver et al. 2000). Karst features are formed when slightly acidic groundwater dissolves the soft stone, carving out spaces and cavities below the surface. Over time, larger and larger voids may be created.

Karst provides a labyrinth of specialized habitats for a group of highly adapted underground species. Aquatic karst species such as cavefish and cave crayfish are well adapted to their nutrient poor environment, have lower metabolic and reproductive rates, and lack pigments and eyes. Changes in temperature, groundwater flow or chemistry, or other habitat disturbances in karst systems can have severe impacts on resident aquatic species. The unique adaptations that ensure their survival in this underground world limit their ability to tolerate changes in their physical environment.

Of the 9,200 known caves in the Ozarks region, Arkansas has approximately 3,000, including Cave Springs Cave near Fayetteville, Arkansas. The human population in this region has increased dramatically in recent times, and development consumes hundreds

of above-ground acres each year. Cave Springs Cave is home to a maternity colony of endangered gray bats (*Myotis grisescens*) and the largest known population of the threatened Ozark cavefish (*Amblyopsis rosae*). Historically, the Ozark cave amphipod (*Stygobromus ozarkensis*) also was known to inhabit Cave Springs Cave, although recent surveys have not confirmed its survival at this site. The fragile karst habitat of Cave Springs Cave is continually exposed to, and threatened by, activities that occur above ground in the area that contributes water to the cave (the cave's recharge area). In 1984, in an effort to protect its sensitive resources, the Arkansas Natural Heritage Commission purchased the cave entrance and 15 acres (6 hectares) surrounding it.

Recharge areas contain streams that feed the karst underground through fractures in the stream beds, sinkholes

How karst systems are formed

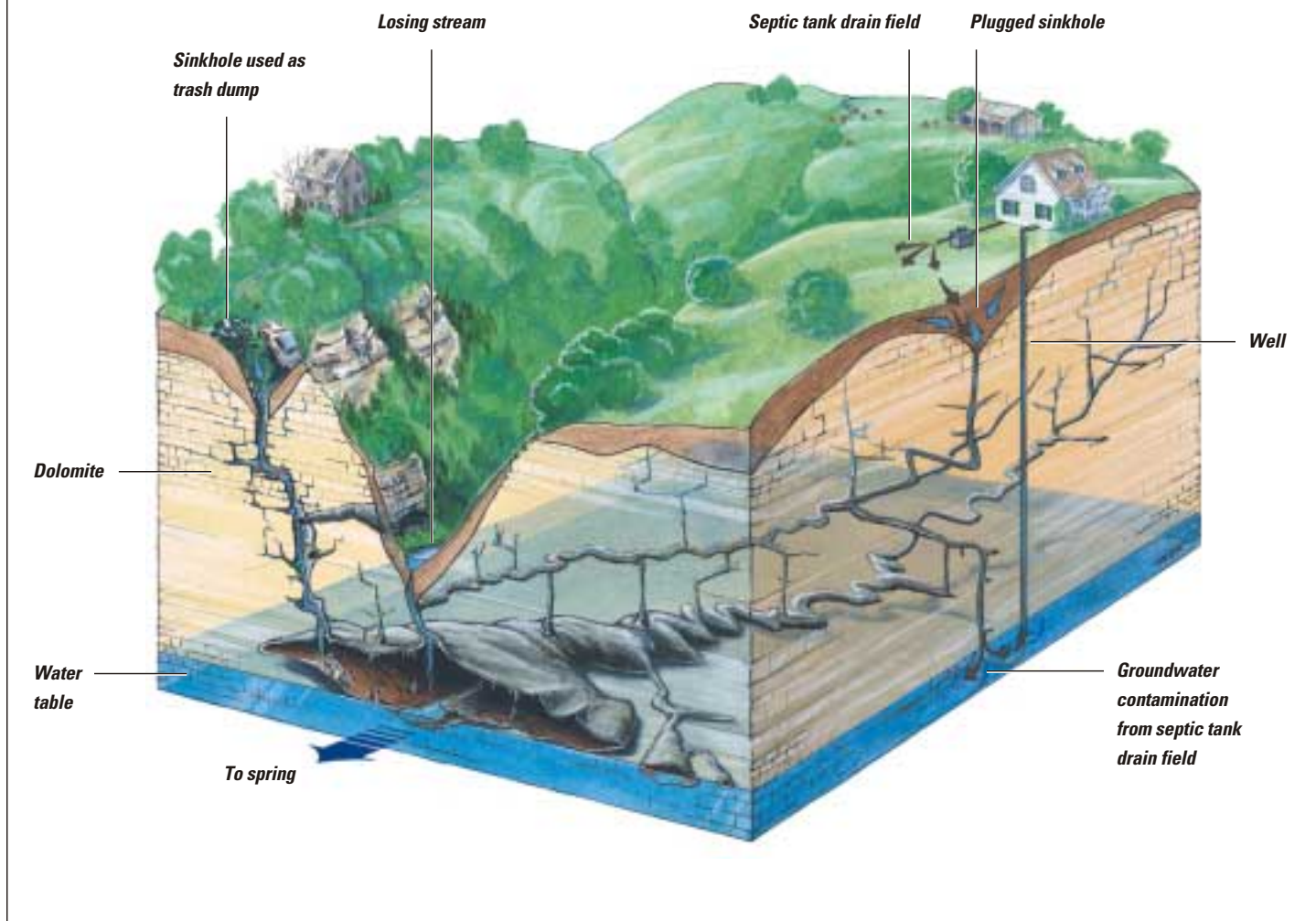


Illustration by Mark Raithe

that funnel precipitation into groundwater conduits, or fractured limestone overlain by thin layers of permeable soil. The Cave Springs Cave recharge area is estimated at approximately 23 square miles (60 sq. kilometers), and activities that occur in the recharge area up to 4 to 5 miles (6 to 8 km) from Cave Springs Cave can affect its sensitive aquatic species.

Groundwater recharge from sinkholes and streams can transmit more pollution than the recharge that filters through soil layers in non-karst regions. Because groundwater can move quickly into and through dissolved openings in a karst network, very little filtration occurs. Consequently, chemical spills and nutrients from chicken litter, sewage sludge, residential septic fields, or other sources can reach underground

aquatic habitats within hours or even minutes. When the Ozark cavefish was listed as endangered in 1984, over-collection was listed as one of the primary threats. Today, habitat degradation from certain land use activities may be the most serious threat.

In the karst areas of Arkansas, poultry litter, other animal waste, and municipal sewage sludge are commonly spread onto pastures. Some of the nutrients are assimilated by vegetation and converted to foliage. The remaining nutrients and chemicals enter the groundwater system during rainstorms through sinkholes and streams, contaminating the aquatic habitat of cave species. Development can also have profound effects on water quantity as well as quality in karst systems. Parking lots and buildings convert the surface

from permeable soil to impermeable asphalt, concrete, or structures. After development, precipitation no longer percolates through the soil to recharge the groundwater. Instead, water is efficiently collected with culverts, concrete lined ditches, and storm drains, and diverted from recharge areas. The resultant changes in water volumes of karst systems can seriously affect cave life.

Art Brown and Geo Graening of the Department of Biological Sciences at the University of Arkansas in Fayetteville recently reported on their research into the environmental quality of Cave Springs Cave. Funded by the Arkansas Natural Heritage Commission, the research identified a number of potential environmental threats, including 15 years of increasing nutrient and bacterial pollution, and the occurrence of heavy metals in cave sediments and the tissues of cave organisms. Phthalates, industrial plasticizers that disrupt animal development, were also detected in resident crayfish. Fecal coliform measurements typically exceeded state water quality standards, sometimes by a factor of 1,000. In addition, some heavy metals exceeded acute or chronic water pollution levels. Concentrations of contaminants were found to be highest during storm events.

A crucial first step in protecting aquatic cave habitat is the identification of recharge areas. In many cases, karst groundwater may move from one surface stream basin to another. As a result, recharge area delineations require groundwater tracing studies, which are routinely performed using highly detectable (but not harmful) fluorescent dyes.

The solution to the problems affecting karst habitats is increased cooperation in the development of protective strategies by government agencies, private landowners, industry, and agriculture. With that in mind, the

Arkansas Ecological Services Field Office of the Fish and Wildlife Service has introduced a karst conservation initiative for the Ozark Plateau region. Modeled after the highly successful Partners in Flight program, this group effort will apply an ecosystem approach karst conservation efforts in the Ozark Plateau region of Arkansas, Oklahoma, and Missouri.

The Arkansas Field Office is recruiting members for the working group, the Karst Resources Support Team (KaRST). Members will include Service representatives of the Ozark Plateau region (including the Service's Ozark Plateau and Arkansas Red River Ecosystem Teams; our Arkansas, Oklahoma, and Missouri Ecological Services Field Offices; and national wildlife refuges and national fish hatcheries), other government agencies, organizations, private landowners, academia, caving clubs, and elected officials. KaRST will work cooperatively to identify priority areas, establish goals and strategies, pool resources, and target research needs. All activities will be implemented with the cooperation of willing landowners and fine-tuned over time. Considered the ideal solution to a difficult issue, KaRST will lead conservation for Ozark Plateau karst habitats in the new century.

Raye Nilius is a biologist in the Service's Conway, Arkansas, Field Office. Dr. Graening is with the Department of Biological Sciences at the University of Arkansas, Fayetteville.

References

- Elliott, William R. Missouri Department of Conservation. 2000. "Below Missouri Karst." Missouri Conservationist. Volume 61(3) pps. 5-7.
- Culver, D.C., L.L. Master, M.C. Christman, and H.H. Hobbs. 2000. Obligate Cave Fauna of the 48 Contiguous United States. Conservation Biology, Volume 14(2) pps. 386-401.



Except when humans are present, these Ozark cavefish live in a world without light, where there is no need for eyes or pigmentation. But they do need clean water, and are threatened by contamination in cave recharge zones.

Photo at left by Brian Wagner

Photo below by John and Karen Hollingsworth



Rounding up Razorbacks

*E*very spring, fish biologists from the Fish and Wildlife Service and several other federal and state resource management agencies gather on the lower Colorado River for the “Razorback Round-up.” The round-up coincides with the spawning of the razorback sucker (*Xyrauchen texanus*), a fish in danger of extinction. The razorback is named for the keel-like ridge on its back that helps it navigate fast-flowing water.

With the aid of electrofishing gear and trammel nets, biologists collect sexually mature fish and haul them to Willow Beach National Fish Hatchery, Arizona, where they are spawned. Later, the adults are returned alive to the waters from which they were collected.

Why this procedure is necessary speaks to the problems of habitat loss and competition with, and predation by, non-native species.

“Razorback sucker populations took a heavy hit from habitat loss and the introduction of non-native fishes,” said Manuel Ulibarri, manager of Willow Beach National Fish Hatchery. “Dams altered water temperature and inun-

dated habitats necessary for survival. Those razorbacks that do spawn in the wild are disadvantaged by carp and other non-native fishes that eat the eggs. The result is a severely depleted native stock of mostly very old fish.”

The oldest razorback suckers in the wild probably hatched during the Eisenhower Administration. These fish do live a long time, up to 45 years—but now without successful natural reproduction. Old fish make up most of the population, and the population gets smaller every year.

“Fully 90 percent of the world’s razorback sucker population occurs in Lake Mojave,” said Dr. Chuck Minckley





of the Service's Arizona Fishery Resources Office. "That translates to a small number of fish in a small area. Our annual round-up helps us manage for a wild population that is increasingly becoming older."

This spring, biologists collected 80 razorback suckers in Lake Mojave between Willow Beach National Fish Hatchery and Hoover Dam. Those fish yielded 300,000 larvae that will be stocked throughout the Colorado River system when they are larger. Leading-edge captive breeding techniques, like sperm cryopreservation and egg storage, allows biologists to ensure a diversity of genetic material for future generations of razorbacks. Most of the young razorbacks are grown in predator-free waters for about 18 months until they reach about 10 inches (25 centimeters) in length. Biologists then tag the fish and release them to face the rigors of the wild.

Downstream in Lake Havasu, 38 adult razorbacks were collected this

year. All but one of them carried tags, which is a clear indication that repatriated razorbacks are surviving. Dr. Minckley estimates that about 9,000 adult fish remain in the wild at the two lakes, with an additional 3,000 to 4,000 repatriates.

The annual "Razorback Round-up" has become an important management tool for biologists seeking to conserve this species. Data collected during the round-up will help biologists determine the distribution and abundance of this imperiled fish.

"What we do is fundamentally no different than propagating the California condor," said Minckley. "When things get too rough in the wild because of man's actions, man has the responsibility to step in and take corrective actions. If we didn't, razorbacks would go extinct."

Craig L. Springer is with the Division of Fisheries in the Service's Albuquerque, New Mexico, Regional Office.

USFWS photos

by Michael F. Delany

The Low-down on Grasshopper Sparrow Nests



Photo by D.R. Progulski, Jr.

For the low-down on grasshopper sparrow (*Ammodramus savannarum*) nests, you need to get down low. The well concealed nests are constructed in shallow excavations in the ground. Recent measurements at nests of the endangered Florida subspecies (*A. s. floridanus*) provide the first quantitative description of grasshopper sparrow nest sites.

The Florida grasshopper sparrow is endemic to the south-central prairie region of the state, and was listed as endangered because of its restricted distribution, loss of habitat, and population decline. Breeding aggregations are known from only six locations, with a total estimated breeding population of fewer than 1,000 birds. Basic information on nesting ecology was needed to develop management plans for the sparrow. Nest structure and features of the nest site may have important implications for reproductive success and

population stability. If the population continues to decline and nears extinction, the recovery plan recommends that captive propagation be initiated. Information on nests and nest sites from a wild population would be important if that drastic effort becomes necessary.

To gather that information, we studied Florida grasshopper sparrow nests on a 1,729 acre (700-hectare) prairie at the Avon Park Air Force Range in Highlands County, Florida. Observations of adults delivering food to nestlings and of females flushed from incubation helped us find the nests. The nests and features of the surrounding vegetation were measured after young fledged or after the nest failed.

We found 20 nests containing eggs or young. Nest cup rims were level with the ground and all nests were domed (nest material covered more than 50 percent of the cup). Most were constructed of

A well concealed Florida grasshopper sparrow nest. Vegetation density was higher at nests than at other sites within the bird's breeding territory.

Photo by M.F. Delany



wiregrass (*Aristida* sp.) and bluestem (*Andropogon* sp.), with a soft inner lining of road grass (*Eleocharis baldwinii*). The average nest diameter was 4 inches (10 centimeters). Primary vegetation shielding the nest was dwarf live oak (*Quercus minima*) and saw palmetto (*Serenoa repens*). Vegetation density was higher at nests than at other areas within the breeding territory. Nest openings were oriented in the direction of the lowest vegetation density.

Nest site selection appears to be influenced by the availability of small clumps of dense vegetation within low-density patches 13 feet (4 meters) in diameter. Dense vegetation may conceal the nests and reduce the risk of predation. Grasshopper sparrows usually approach the nest on the ground, and low vegetation density near the nest would facilitate access. An exposed area at the nest opening also would allow a quick exit by the female and make predator distraction displays more visible.

The sparrow probably cannot adapt to habitat perturbations that remove potential nest sites. Since its listing in 1986, habitat loss on private lands has caused Florida grasshopper sparrows to abandon six former breeding locations. Some of those abandoned sites were mechanically cleared and planted with bahia grass (*Paspalum* sp.), pangola grass (*Digitaria* sp.), and American joint vetch (*Aeschynomene americanus*) to improve cattle grazing. Others were plowed and planted with bahia grass for sod production. The sparrow's preference for dense clumps of vegetation within more open patches may restrict nest placement. These vegetation features did not exist at abandoned breeding locations.

Frequent burning (2-3 year intervals) maintains prairie grasslands in an open early successional stage, and appears to promote suitable nesting habitat. Prescribed fires may improve habitat for Florida grasshopper sparrows at other locations. The sparrow seems responsive to habitat restoration, and the creation of additional nesting habitat



near breeding locations may allow some populations to expand. Cattle grazing may also have a role. The low stocking rates (less than 1 cow and calf per 21 acres or 8.7 ha) and short duration grazing (up to 21 days, followed by longer periods of exclusion) on the study area seemed compatible with the sparrow's nesting requirements.

The breeding success of ground-nesting grassland birds is usually less than 50 percent, with most nest loss attributed to predation. Despite a high reproductive potential (an average clutch size of four eggs, and two to three nesting attempts per year), predation may limit recovery efforts for Florida grasshopper sparrows. More information on factors influencing nesting outcome is needed to determine conservation strategies for this rare bird.

Low stocking rates of cattle and short duration grazing seem compatible with the sparrow's nesting requirements.

Photo by M.F. Delany

Michael Delany is a biologist at the Florida Fish and Wildlife Conservation Commission's Wildlife Research Laboratory in Gainesville, Florida.

by Barbara Maxfield

Hawaiian Bird Chick is a First

Marking the first time the species has been bred in captivity, an endangered Maui parrotbill (*Pseudonestor xanthophrys*) chick hatched on July 21, 2000, at the Keauhou Bird Conservation Center on the island of Hawai'i. The encouraging news makes it possible that, with captive breeding as a tool, this extremely rare forest bird will eventually recover.

"This is really a quantum leap," said Alan Lieberman, co-director of the Zoological Society of San Diego's programs in Hawaii. "It's a big step to have captive adult birds healthy and content enough to breed."

its feeding habits, and it uses its strong, parrot-like bill to tear apart decaying timber in search of insects and larvae. The number of Maui parrotbills in the wild has dwindled to fewer than 500. An introduced avian disease carried by non-native mosquitos is thought to be the primary reason for the parrotbill's decline, said Thane Pratt, a wildlife biologist for the U.S. Geological Survey's Biological Resource Division. Other major threats to the bird are habitat destruction, encroachment of invasive species, and introduced predators such as rats. Restoration of mature forests and elimination of unnatural predators will be necessary for most native Hawaiian forest birds to thrive in the wild, Pratt said.

The center currently holds three adult parrotbills, including the pair that bred. Two other endangered Hawaiian songbirds being held at the center, the palila (*Loxioides bailleui*) and the Hawaii creeper (*Oreomystis mana*), also successfully bred for the first time this year. The center plans to keep a small, genetically diverse population of each species to help replenish numbers in the wild once proper habitat has been secured. Partners in the Hawaiian forest bird conservation programs include Hawaii's Department of Land and Natural Resources, The Peregrine Fund, the U.S. Geological Survey's Biological Resources Division, the Zoological Society of San Diego, the Fish and Wildlife Service, and numerous private landowners.

Barbara Maxfield is a Public Affairs Specialist in the Service's Honolulu, Hawaii, Field Office.



Above, a 20-day old Maui parrotbill.

Photo by Alan Lieberman/Zoological Society of San Diego

Above right, a parrotbill peels away bark in search of food.

Illustration by Rochelle Mason,
www.rmasonfinearts.com



The chick's parents hatched at the center from eggs collected in the wild in 1997 and 1999. Until now, little has been observed of the birds' breeding behavior because they normally live in a rugged, remote area.

The Maui parrotbill, an olive-green to yellowish bird the size of a small canary, is found only on Maui's mid-to-high-elevation eastern rainforests in the Hanawi Natural Area Reserve and The Nature Conservancy's Waikamoi Preserve. The parrotbill, like other rare Hawaiian forest birds, is a specialist in

During June and July of 2000, the Fish and Wildlife Service published the following Endangered Species Act (ESA) listing actions in the *Federal Register*. The full text of each proposed and final rule can be accessed through our website:

<http://endangered.fws.gov>.

Listing Proposals

Three Pacific Plants On June 1, we proposed to list three plant species endemic to the Mariana Islands in the Pacific Ocean as endangered. *Nesogenes rotensis*, a herbaceous perennial in the verbena family (Verbenaceae), and *Osmoxylon mariannense*, a spindly tree in the ginseng family (Araliaceae), are found only on the island of Rota in the U.S. Commonwealth of the Northern Mariana Islands. The third, *Tabernaemontana rotensis*, a small tree in the dogbane family (Apocynaceae), occurs on Rota and the U.S. Territory of Guam in the southern Marianas.

The three plant species are threatened primarily by loss of their native habitat. Over the years, native vegetation on Rota and Guam has been altered by ranching, invasive alien plant and animal species, agricultural and recreational development, road construction, and military activities during World War II. Both islands also have been struck frequently by typhoons. Thirty or fewer mature plants remain of each of the three species. With so few plants remaining, another storm could eliminate any of the three species.



Osmoxylon mariannense

USFWS photo

Buena Vista Lake Shrew (*Sorex ornatus relictus*) A small, insect-eating mammal, the Buena Vista Lake shrew is a unique part of the historic San Joaquin Valley ecosystem in California. It now occurs only in the southern end of the valley and is in danger of extinction. On June 1, we proposed to list this animal as endangered.



Photo © B. Moose Peterson/WRP

Biologists believe that the Buena Vista Lake shrew once occurred widely in the marshlands of the Tulare Basin. By the time biologists discovered the shrew in 1932, most of these marshes were drained or dried up by water diversions. Today, the species has lost more than 95 percent its historic habitat. It is already listed by the State of California as a species of special concern.

This remaining population is threatened primarily by agricultural activities, modifications of local hydrology, uncertain water supply, possible toxic effects from selenium leached out of irrigated farm fields, and natural events (such as drought) that could wipe out the small number of remaining animals. Water is a vital component of the shrew's environment because of the moisture required to support the variety of insects that comprise its food source.

The Buena Vista Lake shrew eats more than its own weight each day to support its high metabolism. Shrews benefit surrounding plant communities by consuming large quantities of insects, slugs, and other invertebrates, including agricultural pest species.

Chiricahua Leopard Frog (*Rana chiricahuensis*) On June 14, we proposed to list the Chiricahua leopard frog as threatened due to the effects of non-native predators, disease, habitat loss, and potential natural events, such as floods and drought. The proposal includes a special rule encouraging ranchers to continue their regular management of livestock tanks (impoundments maintained as livestock watering holes) that harbor leopard frogs.

The Chiricahua leopard frog is found in ponds, streams, stock tanks, and other aquatic sites in the mountains of central and east-central Arizona and west-central New Mexico, and in the mountains and valleys of southeastern Arizona and southwestern New Mexico. The species is also known from several sites in Chihuahua, and from single sites in Sonora and Durango, Mexico.

The causes of the species' decline are not completely clear, but biologists believe the frog faces a variety of threats, including nonnative predators (particularly fish, bullfrogs, and crayfish), habitat loss and fragmentation, disease, and environmental contamination. The species apparently has disappeared from entire mountain ranges, valleys, and river drainages within its historic range.

A wide variety of organizations and individuals are involved in Chiricahua leopard frog conservation activities. The Nature Conservancy and New Mexico Game and Fish Department are undertaking conservation efforts on the Mimbres River. Ranchers in southeast Arizona's San Bernardino Valley are working with the University of Arizona and San Bernardino National Wildlife



Photo by A. Rorabaugh

Refuge to construct and maintain habitat for frogs. The Tonto National Forest, Phoenix Zoo, and Arizona Game and Fish Department have reared frogs in captivity and established or reintroduced populations in the Gentry Creek area. Students at Douglas High School and Douglas Public School District in southeast Arizona also have created award-winning outdoor classrooms for the rearing of leopard frogs.

The frog historically occurred at 212 sites in Arizona, 170 sites in New Mexico, and 12 or 13 sites in Mexico. Since 1995, the frog has been found at only 52 Arizona and 27 New Mexico sites, while the status of populations in Mexico is unknown. Of the 79 remaining U.S. populations, 47 occur on Forest Service lands, mostly in the Coronado National Forest. Some can also be found in the Apache-Sitgreaves, Tonto, and Coconino National Forests in Arizona and the Gila National Forest in New Mexico. The other populations are primarily on private lands.

Many Chiricahua leopard frog populations occupy stock tanks. The special rule in the proposed listing is designed to allow operation and maintenance of stock tanks that support frogs on non-federal land without the usually required permits authorizing "take" of a listed species, should the maintenance incidentally harass, harm, or kill a leopard frog.

We plan to work with other federal agencies and local planning groups to restore and conserve wetlands that provide vital habitat for the species. Controlling non-native aquatic species will also be necessary for the survival of the frog.

Reclassification Proposals

Large-flowered Skullcap (*Scutellaria montana*) Habitat protection and the discovery of additional populations led us to propose on July 12 to reclassify this endangered wildflower from endangered to the less critical status of threatened. The large-flowered skullcap, a perennial herb, grows on rocky, dry slopes, ravines, and stream bottom forests in the ridges, valleys, and Cumberland Plateau of northwestern Georgia and adjacent southeastern Tennessee.



Corel Corp. photo

Gray Wolf (*Canis lupus*) As reported previously in the *Bulletin*, we proposed on July 13 to recognize the improving status of the gray wolf in the conterminous 48 states by reclassifying most populations from endangered to threatened. The proposal, if approved, would reorganize wolf management by establishing four distinct population segments (DPSs). Gray wolves in the Western Great Lakes DPS (including Minnesota, Michigan, North Dakota, South Dakota, and Wisconsin) and the Western DPS (including Montana, Wyoming, Idaho, Oregon, Colorado, Washington, Utah, and portions of Arizona and New Mexico) would be reclassified as threatened. Although there have been no recent verified reports of wolves in the Northeastern DPS (including Maine, New Hampshire, New York, and Vermont), this region does have high potential for wolf recovery, and any wolves returning there would also be classified as threatened. Wolves in the Southwestern DPS (including parts of Arizona, New Mexico, and Mexico), where the Service is continuing its efforts to reintroduce the Mexican gray wolf, will remain classified as endangered.

All or portions of 30 states (within the lower 48) lie outside the four DPS areas described above, and gray wolves are not believed to be present in those other parts of the country. The Service does not believe that wolf restoration in these areas is necessary in order to achieve wolf recovery; therefore, the proposed rule would remove any wolves that may occur there now or in the future from ESA protection.

Critical Habitat Proposals

Critical habitat, as defined in the ESA, is a term for a geographic area that is essential for the conservation of a listed species. Critical habitat designations do not establish wildlife refuge, wilderness area, or any other type of conservation reserve, nor do they affect actions of a purely private nature. They are intended to delineate areas in which federal agencies must consult with the Service to ensure that actions these agencies authorize, fund, or carry out do not adversely modify the critical habitat. Within designated critical habitat boundaries, federal agencies are required to consult only in those areas that contain the physical and biological features necessary for the species' survival and recovery; many developed areas within the boundaries no longer contain suitable habitat. Maps and more specific information on critical habitats are contained in the specific *Federal Register* notice designating each area. For more information on critical habitat designations in general, go to the website for our Endangered Species Listing Program (<http://endangered.fws.gov/listing/index.html>) and click on "About Critical Habitat."

Critical Habitat for Arroyo Southwestern Toad (*Bufo microscaphus californicus*)

Approximately 478,400 acres (193,600 hectares) fall within the boundaries of a critical habitat designation proposed on June 8 for an endangered amphibian, the arroyo southwestern toad. These lands encompass portions of Monterey, Santa Barbara, Ventura, Los Angeles, San Bernardino, Orange, Riverside, and San Diego counties in southern California. Arroyo toads have specialized requirements for breeding habitats: shallow, slow-moving streams and riparian areas that are disturbed naturally on a regular basis, primarily by flooding. Only those areas within the proposed critical habitat boundary that contain the primary constituent elements required by the toad would be considered critical habitat.

Critical Habitat for Arkansas River Shiner (*Notropis girardi*)

On June 30, we proposed a critical habitat designation for the threatened Arkansas River basin population of this small fish. The proposal covers approximately 1,160

miles (1,865 kilometers) of rivers and 300 feet (91 meters) of the adjacent riparian zone along portions of the Arkansas River in Kansas, Cimarron River in Kansas and Oklahoma, Beaver/North Canadian River in Oklahoma, and Canadian/South Canadian River in New Mexico, Texas, and Oklahoma. Conservation of riparian zones is important to allow for natural flooding patterns, channel changes, nutrient sources, buffering from sediment and pollutants, and side channels and backwater habitats for larvae and juvenile fish.

Critical Habitat for the Peninsular Bighorn Sheep (*Ovis canadensis*) Approximately 875,613 acres (354,343 hectares) in Riverside, San Diego, and Imperial counties in southern California were proposed on July 5 as critical habitat for this endangered population of bighorn sheep. It inhabits the Peninsular Mountain Ranges from the San Jacinto Mountains south to the Volcan Tres Virgenes Mountains in Baja California, Mexico. The sheep occur mostly on open slopes in the hot, dry desert regions where the land is rough, rocky and sparsely vegetated. During the dry months, the sheep tend to gather near sources of water.



Photo © B. Moose Peterson/WRP

Critical Habitat for Piping Plovers (*Charadrius melodus*) Two proposals to designate critical habitat for a small beach-nesting bird, the piping plover, were published July 6. One proposal addresses the endangered breeding population in the Great Lakes region. It would encompass 37 scattered units of mainly undisturbed Great Lakes shoreline totaling almost 189 miles (305 kilometers) in the states of Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, Penn-

sylvania, and New York. Within these units, the proposal addresses areas of open, sparsely vegetated sandy habitats, such as sand spits or beaches associated with wide, unforested systems of dunes and inter-dune wetlands. Specific features needed by piping plovers are patches of vegetation, cobble, debris (such as driftwood), and other forms of protection for nests and chicks.

A separate July 6 proposal would designate critical habitat in the piping plover's wintering habitat along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. A total of approximately 1,672 miles (2,691 km) of shoreline along the Gulf and Atlantic coasts, and along the margins of interior bays, inlets, and lagoons, are included in the proposal.

Critical Habitat for the Zayante Band-winged Grasshopper (*Trimerotropis infantilis*) On July 7, we proposed to designate a 10,560-acre (4,230-ha) area in Santa Cruz County, California, as critical habitat for an endangered insect, the Zayante band-winged grasshopper. Associated with the Zayante soil series, this species inhabits a unique mosaic of northern maritime chaparral and coastal maritime ponderosa forest.

Critical Habitat for the Morro Shoulderband Snail (*Helminthoglypta walkeriana*) Approximately 2,566 acres (1,039 ha) in western San Luis Obispo County, California, were proposed on July 12 as critical habitat for the Morro shoulderband snail, an endangered mollusk. This species lives exclusively in or near sandy soils within coastal dune and scrub communities and maritime chaparral.

Critical Habitat for Zapata Bladderpod (*Lesquerella thamnophila*) On July 19, we proposed designating approximately 5,330 acres (2,157 ha) of the Lower Rio Grande National Wildlife Refuge in Starr County and several other small sites in Starr and Zapata counties as critical habitat for the Zapata bladderpod, an endangered plant known only from south Texas. The few remaining populations can occur on graveled to sandy-loam upland terraces above the Rio Grande floodplain.

Critical Habitat for the Mexican Spotted Owl (*Strix occidentalis lucida*) A July 21 proposal would designate nearly 13.5 million acres (5.5 million ha) in Arizona, New Mexico, Colorado, and Utah as critical habitat for a threatened bird, the Mexican spotted owl. Approximately 90 percent of the proposed acreage is federally managed land and the other 10 percent is comprised of Tribal land. No private or state lands were included in the proposal. Within these broad boundaries, however, we will require ESA consultation only in those areas that contain suitable habitat for the owl; towns and other developed areas would not be considered critical habitat.

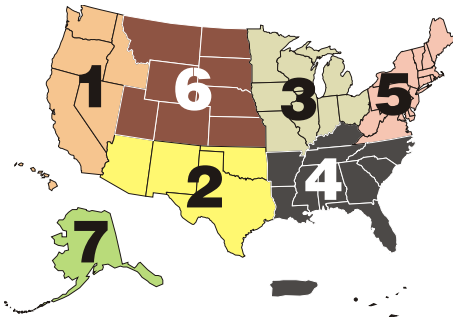
Final Listing Rules

Short-tailed Albatross (*Phoebastria albatrus*) With a population of fewer than 600 breeding individuals, the short-tailed albatross is one of the world's rarest birds. Although it has been classified since 1970 as endangered, the albatross, which breeds only on two remote Japanese islands, was listed solely as a foreign species. Because of this oversight, the far-ranging seabird was not legally protected under the ESA when it ventured into Alaska, Washington, Oregon, California, and Hawaii. To correct this administrative error, the Service published a final rule on July 31 extending ESA protection to the short-tailed albatross in the U.S.

Steelhead (*Oncorhynchus mykiss*) On June 7, the National Marine Fisheries Service (which has primary ESA jurisdiction for most marine species) published a final rule listing the northern California "ecological significant unit" of the steelhead as threatened. Only anadromous steelhead were covered under the rule.



Illustration © by Rochelle Mason, www.rmasonfinearts.com



Regional endangered species staffers have reported the following news:

Region 4

Loggerhead Sea Turtle (*Caretta caretta*)

During August 2000, the National Sea Turtle Coordinators for the Fish and Wildlife Service (Service) and National Marine Fisheries Service attached satellite transmitters to five loggerhead sea turtles at the Archie Carr National Wildlife Refuge in Florida, with assistance from the University of Central Florida. Florida beaches account for 90 percent of loggerhead nesting in the southeastern United States, a population that is the largest in the western hemisphere and one of the two largest in the world.

We attached satellite transmitters to turtles that had just finished nesting. Each transmitter is attached to the shell with fiberglass cloth and polyester resin, and is designed to fall off harmlessly when the batteries are exhausted. The transmitter sends out radio signals through a small

antenna to be received by one of several polar orbiting National Oceanic and Atmospheric Administration satellites that collect environmental data around the world. The satellite re-transmits the data back to earth, where it is processed and made available to researchers.

This collaborative effort is aimed at locating the migratory routes and principle foraging habitats of Florida loggerheads after they nest. The collected data will help identify the threats that sea turtles may encounter while traveling to and from their nesting beaches and while residing at their foraging areas. This information will be of vital importance to the Services in determining where international cooperative efforts should be focused to ensure recovery of these shared sea turtle resources.

During 1998 and 1999, 10 satellite transmitters were deployed at the Archie Carr refuge. The results indicate that post-nesting Florida loggerheads migrate over long distances and may travel through, and reside in, the waters of other nations, including Cuba, the Bahamas, and Mexico.

The public can follow the journey of these five turtles via the Internet at <http://www.cccturtle.org> as part of a public education project spearheaded by the Caribbean Conservation Corporation's Sea Turtle Survival League.

Reported by Sandy MacPherson of the Service's Jacksonville, Florida, Field Office.

Region 5

Seabeach Amaranth (*Amaranthus pumilus*)

A threatened plant, the seabeach amaranth was recently rediscovered in three States within its historical range: New Jersey, Delaware, and Maryland. Seabeach amaranth occurred historically in nine states from Massachusetts to South Carolina, but was previously considered extirpated from six of these states. Prior to the recent discoveries, the plant was known to exist only in New York, North Carolina, and South Carolina.

Staff from the U.S. Army Corps of Engineers' New York District, the New Jersey Conserve Wildlife

Foundation, and the Service's New Jersey Field Office discovered several occurrences of the plant in Monmouth County, New Jersey, in July 2000. The Service alerted National Park Service staff at the nearby Sandy Hook Unit of the Gateway National Recreation Area and recommended surveys. Subsequent searches documented four additional seabeach amaranth sites at Sandy Hook. The last known occurrence of seabeach amaranth in New Jersey was in 1913, and the plant had not been found in Monmouth County since 1899. Seabeach amaranth was also documented in Delaware this year after an absence of 125 years, and it was found in Maryland in 1998 after being extirpated from that state for more than 30 years. Recent surveys have documented approximately 4 plants in Maryland, 50 plants in Delaware, and more than 1,000 plants in New Jersey.

The Monmouth County municipal beaches where the plant was found were created by a Corps beach nourishment project in 1995. The Corps has since worked with the Service, the New Jersey Endangered and Nongame Species Program, and local municipalities to monitor and manage beach-nesting birds, including the piping plover (*Charadrius melodus*), using the newly created habitat. Staff from the Corps and our New Jersey Field Office have met with officials from Monmouth County municipalities to inform them of the plant's discovery, and to solicit their cooperation in protecting seabeach amaranth from threats associated with pedestrians and vehicles. The municipalities were receptive, and agreed to alert public works and emergency vehicle operators, and to permit fencing in high traffic areas containing large numbers of plants. The Service is also working with the municipalities to inform area residents about the newly discovered plant.

Efforts are also underway to restore seabeach amaranth populations in Maryland by planting seedlings, propagated from seeds of Maryland plants, on Assateague Island. The National Park Service, Maryland Wildlife and Heritage Division, and the Service are cooperating in this effort.

Biologists do not yet have enough information to determine how seabeach amaranth returned to New Jersey after its almost 90-year absence. Seeds



Loggerhead turtle

Photo by Mike Lubich



Seabreath amaranth

Photo by Mark Burlas

may have blown or floated from Long Island, may have washed up from the Carolinas during a tropical storm, or may have been buried in the offshore sands used to nourish the beach. Plants from the newly discovered populations in Delaware, Maryland, and New Jersey will be included in a genetics study of seabreath amaranth. Results of the study may provide insight into the plant's sudden reappearance in these three States.

Reported by Wendy Walsh of the Service's New Jersey Field Office.

Piping Plover During the 2000 piping plover breeding season, the Service's Long Island, New York, Field Office worked with approximately 25 partners consisting of federal, state, and local governmental agencies, as well as non-governmental organizations, to protect approximately 40 miles (65 kilometers) of coastal habitat along



Piping plover nest

Photo by Mark Burlas

the north and south shores of Long Island for breeding piping plovers and their chicks. Long Island supports approximately two-thirds of the New York-New Jersey recovery population for this species. The protection efforts consisted of fencing suitable breeding sites, surveying for breeding pairs, the protection of nests from predators through the use of predator exclosures, monitoring of chick productivity, and the protection of brood rearing areas from human disturbance.

Seabeach Amaranth The protection efforts undertaken by the Long Island Field Office and its partners for the protection of piping plovers allowed seabeach amaranth to flourish this year, with preliminary survey results indicating that Long Island supported over 130,000 plants this year. This is up from 12,000 plants observed during the 1999 seabeach amaranth survey. Seabeach amaranth, like the piping plover, is a species that prefers early successional beach habitats. The Long Island Field Office and its partners are considering a number of restoration/enhancement proposals for implementation in 2001 that will further the conservation of these species.

Reported by Steve Papa of the Service's Long Island, New York, Field Office.

A wealth of further information on the subjects covered in this edition of the *Endangered Species Bulletin* is available on the Internet. Here are some websites to get you started:

"The Mystery of the Dying Eagles" — Additional information on the disease AVM is available at <http://www.mvk.usace.army.mil/offices/od/odm/avm>.

"Disease Strikes Again at Salton Sea" — For more information about the Salton Sea, disease outbreaks, and brown pelicans, see our website at www.rl.fws.gov/refuges/.














"A Unified Defense Against Invasive Species" — Details on our efforts to control invasive non-native species is available at <http://invasives.fws.gov/> or <http://www.invasivespecies.gov>.

"A New Threat to Frogs" — For more information on the Service's role in the amphibian malformation and deformity issue, and a complete list of the refuges that are being surveyed this year, check out the Amphibian Deformities section of the Service's Division of Environmental Quality website at <http://contaminants.fws.gov/>.

"Hawaiian Bird Chick is a First" — More information about the Maui parrotbill is available at <http://pacific.fws.gov/pacific/wesa/parrotmaui.html>.

BOX SCORE

Listings and Recovery Plans as of October 31, 2000

GROUP	ENDANGERED		THREATENED		TOTAL LISTINGS	U.S. SPECIES W/ PLANS**
	U.S.	FOREIGN	U.S.	FOREIGN		
 MAMMALS	63	251	9	17	340	47
 BIRDS	78	175	15	6	274	76
 REPTILES	14	64	22	15	115	30
 AMPHIBIANS	10	8	8	1	27	12
 FISHES	69	11	44	0	124	90
 SNAILS	20	1	11	0	32	20
 CLAMS	61	2	8	0	71	45
 CRUSTACEANS	18	0	3	0	21	12
 INSECTS	30	4	9	0	43	28
 ARACHNIDS	6	0	0	0	6	5
ANIMAL SUBTOTAL	369	516	129	39	1,053	365
 FLOWERING PLANTS	564	1	141	0	706	528
 CONIFERS	2	0	1	2	5	2
 FERNS AND OTHERS	26	0	2	0	28	28
PLANT SUBTOTAL	592	1	144	2	739	558
GRAND TOTAL	961	517	273	41	1,792*	923

TOTAL U.S. ENDANGERED: 961 (369 animals, 592 plants)
TOTAL U.S. THREATENED: 273 (129 animals, 144 plants)
TOTAL U.S. LISTED: 1,234 (498 animals***, 736 plants)

*Separate populations of a species listed both as Endangered and Threatened are tallied once, for the endangered population only. Those species are the argali, chimpanzee, leopard, Stellar sea lion, gray wolf, piping plover, roseate tern, green sea turtle, saltwater crocodile, and olive ridley sea turtle. For the

purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

**There are 530 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

***Nine animal species have dual status in the U.S.

FIRST CLASS
 POSTAGE AND FEES PAID
 U.S. DEPARTMENT OF THE INTERIOR
 PERMIT NO. G-77

*U.S. Department of the Interior
 Fish and Wildlife Service
 Washington, D.C. 20240*